Art. II.—*Further Coccid Notes: with Descriptions of several New Species, and Discussion of various Points of Interest.*

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Plates III.–VIII.

Some of the insects dealt with in this paper are not inferior in peculiarity and complexity to those which I have at various times reported. I venture to think also that the discovery in Australia of *Icerya ægyptiaca* and of a very near variety of *Icerya rosæ* is of general interest. Four at least of the forms belonging to the genus *Icerya* are now known to inhabit Australia, and it may be worth while to investigate the question whether that country is not the original habitation of the genus. That, however, would require to be done by some Australian observer, and is beyond my power.

I am constrained to refer to a point in connection with the classification which I have laid down for the family *Coccidæ*, on account of a remark in a paper by Mr. J. G. O. Tepper, of Adelaide, published in the "Transactions of the Royal Society of South Australia," vol. xvii., part 2, December, 1893. The paper is on South Australian species of *Brachyscelinæ*, and at page 269 Mr. Tepper observes that "Mr. Maskell added the genera *Frenchia* and *Carteria* to the Brachyscelidæ, and described and figured *Sphærococcus* and *Cylindrococcus* as of uncertain position, but has lately formed a new sub-family *Idiococcinæ* for their reception. On account of a general similarity of habit, I consider that they should also be included in the family. The first and two last form woody galls similar in structure to those of *Brachyscelis*."

There is an inaccuracy in the last sentence of this passage which requires correction. *Sphærococcus* does not at all always form woody galls. The galls of *S. leptospermi* are woody, and those of *S. froggatti* and *S. pirogallis* may be called so too, but *S. acaciæ* and *S. bambusæ* produce cotton and wax.

However, the main point is that Mr. Tepper would upset my classification on account of "general similarity of habit." I cannot by any means accept the suggestion. It is just this sort of judgment by mere external appearance which it has been my aim and endeavour to destroy and root out during the eighteen years of my study of Coccids. A reliance upon the appearance of a Coccid to the naked eye or under a Coddington or Browning lens is calculated to lead to in-

numerable mistakes and confusion. The proper way to study this family is to give to every species very close and minute investigation, and rather to wait weeks or months before naming a species than to define it on the hasty examination of a few minutes. Now, not only will Coccids as between themselves easily mislead a believer in "similarity of habit," but they will induce him to include amongst them forms which are not Coccid at all. For example, *Lecanium baccatum* has almost every external character of a *Kermes: Prosopophora dendrobii* is outwardly very much like a Lecanid; or, to take a still clearer case, it is just the judging by external characters which has led some observers to place *Planchonia* in the Lecaniodiaspinæ, and make terrible confusion. These are all Coccids; but "similarity of habit" would make us mix all sorts of families together. Cynipids make woody galls, so do some Chalcids, so do some Psyllids. And the force of this is clearly shown in Mr. Tepper's own paper, where he includes as a Coccid a form which he names "*Asccelis* (?) *multitudinea*," and which is most certainly the gall made by a Psyllid of the genus *Trioza*. Neither the naked eye nor a lens can distinguish this gall from that of a Coccid, yet it is certainly not so.

Everybody is liable to make absurd mistakes. In 1878, just because I did not take sufficient trouble, I included a Psyllid and two Aleurodids amongst Coccids: and Signoret himself wanted to make a new Coccid genus, *Spondyliaspis*, out of an Australian Psyllid making a waxy scale. There is not the slightest fault, therefore, to be found with Mr. Tepper for his error about *Asccelis*. But when it comes to proposing a classification founded upon "general similarity of habit," a protest is necessary, and I am compelled to adhere to my system, under which neither *Cylindrococcus* nor *Sphærococcus* can enter the sub-family Brachyscelinæ.

Finally, I have myself to eat humble pie; and, bowing to the voice of the majority, to withdraw my nomenclature of the past as regards the names of groups and sub-families. In this paper, therefore, I write *Lecaninæ*, *Dactylopinæ*, &c., and trust that whatever good there may be in my work may not be obscured or neutralised by any orthographical crimes.

Group DIASPIDINÆ.

Genus Aspidiotus.

Aspidiotus casuarinæ, sp. nov. Plate III., figs. 1–3.

Female puparium dark yellowish-brown; circular, rather convex; pellicles yellow. Diameter about $\frac{1}{23}$in.

Male puparium brown, the posterior end whitish; form elongated, subcylindrical, slightly convex, not carinated.

Length about $\frac{1}{23}$in. The posterior extremity is usually open, so that the puparium seems as if formed of an upper and lower plate joined together for the greater part of their length, between which the insect lies.

Adult female yellow. The form is rather more elongated than usual in the genus, and there is a shallow transverse groove just below the rostrum. Abdomen ending in six narrow lobes with rounded ends, and between them a few very short hairs. The abdomen is somewhat tapering, and the margin above the lobes is slightly serratulate. There are no groups of spinnerets, but on all the abdominal segments are rows of large single orifices, very numerous; and on the last segment these rows converge to the terminal lobes. At the level of the rostrum are two small spinneret groups, each having about six orifices.

The male pupa may very easily be mistaken for the adult female of some other Diaspid. It is reddish-yellow or brown, somewhat elongated, subcylindrical with a tapering abdomen which ends in six small almost contiguous lobes, and there are a few converging rows of spinnerets as in the adult female (three on each side). But the presence of only a single pellicle on the puparium from which this form may be extracted denotes clearly the sex; moreover, on careful examination, the commencement of the eyes and the rudimentary elytra may frequently be detected. Length of insect about $\frac{1}{60}$in.

Adult male unknown.

Hab. In Australia, on *Casuarina equisetifolia*. My specimens were sent by Mr. G. H. Brown, from Albury.

This species, in the transverse groove of the female, approaches *A. eucalypti*, Mask., but it is more elongated in form, and the abdominal lobes and spinnerets differ: so also does the male puparium.

Aspidiotus cladii, Maskell. N.Z. Trans., vol. xxiii., 1890, p. 3.

I frequently receive specimens of this insect, chiefly from Victoria or South Australia (indeed, probably none have come from New South Wales). The very rich colours of the puparia vary to some extent: some are dark-brown, others almost blood-red; but the convex form and the orange-coloured pellicles are present in all. The pellicles are frequently raised in a small boss, which, indeed, sometimes has almost the appearance of a little blunt horn on the top of the puparium.

The pellicles are by no means always centrally situated, and, if regard were had only to the female puparium, one might consider the insect as a *Diaspis*. But the male puparium is very certainly smooth and not carinated, and consequently the species must remain attached to *Aspidiotus*.

Genus Chionaspis.

Chionaspis brasiliensis, Signoret.

In reporting last year this insect from India, I stated that the adult female was "brown." Mr. E. E. Green informs me that in life the colour is rather "yellow, deepening in older specimens to orange; in some individuals suffused with purplish-brown." He also considers the live male as red in colour, but two of the specimens I had before me were alive, and were certainly, to my eye, yellow, as I stated in my paper.

Colour is a very fallacious test, as I have before several times remarked.

Genus Mytilaspis.

Mytilaspis formosa, sp. nov. Plate III., figs. 4–6.

Female puparia congregated in groups and patches on the leaf with much white cottony fluff: the surface of the food-plant is very pale straw-colour, and the groups of puparia appear also yellowish, as the yellow pellicles show through the cotton. The puparia are, as a general rule, irregularly placed, but it is by no means uncommon to find them arranged radially, that is, with a common centre, towards which the larval pellicles point, and from which the fibrous portions spread out like a fan. A group so arranged, with the golden pellicles appearing through the white cotton, is very elegant. Length of the puparium averaging $\frac{1}{17}$in. The form is elongated, usually straight, slightly dilated towards the end.

Male puparia congregated in the same groups with the females, and of similar colour; distinguishable mainly by the presence of only one pellicle. Form flattish, cylindrical, not carinated; length about $\frac{1}{27}$in.

Adult female dark-orange or golden-brown; elongated as usual in the genus; length about $\frac{1}{40}$in., but shrivelling at gestation. Abdomen ending in a circular curve, much broken by small denticulate projections. There are two median sub-cylindrical lobes with rounded terminations, and with the margins very minutely serrulate; these lobes are not adjacent, and between them are two short fine spiny hairs: on each side, separated by a short distance, is another smaller lobe. The posterior segments of the abdomen bear a few spines. Pygidium bearing five groups of spinnerets; upper group with five orifices, upper laterals 14 to 18, lower laterals 20 to 24. There are many larger single orifices; and near the extremity, above the lobes and on the dorsal surface, are eight pairs of compound spinnerets, from which spring cylindrical hyaline tubes, extending beyond the margin. These tubes are not serrated at the extremity, and do not resemble the "plates" of *Parlatoria,* but rather the long hyaline tubes of the Acanthococcids.

Adult male not known with certainty.

Hab. In Australia, on *Eucalyptus* sp., probably *E. orbifolia*, as the leaves are short, almost circular, and whitish-yellow. This plant is a native of Western Australia. My specimens came from Mr. J. W. Douglas, who received them "indirectly from Baron Von Mueller"; locality not stated.

Subsequently I received from Mr. French a leaf of *Eucalyptus corynocalyx*, from Renmark, South Australia, with many puparia, both male and female, which seemed to be of this species; but every individual had been parasitised and destroyed. On a withered specimen of a male I noticed a rather long spike.

M. formosa, in its colours and the arrangement of the puparia, is very elegant, and well deserves, I think, the name I have given to it.

Mytilaspis spinifera, sp. nov. Plate III., figs. 7–9.

Female puparium snowy-white, pellicles light-yellow. The larval pellicle is longitudinally corrugated, the second pellicle smooth and subcircular; the white fibrous secretion widens very rapidly, with a terminal subcircular margin, so that the whole puparium is broadly pyriform; the two pellicles together occupy less than half the length. Total length about $\frac{1}{16}$in.

Male puparium white, with yellow pellicle; flattish, subcylindrical, not carinated. Length about $\frac{1}{24}$in. In some specimens observed, half a dozen male puparia were congregated under and partly hidden by that of the female.

Adult female orange-yellow, darkening with age. Form elliptical, with the thoracic and abdominal segments rather distinct. Usually there is a slight covering of white meal on the dorsum. Abdomen ending in a curve, broken by small serrations. There are two median lobes, not adjacent; each lobe has a cylindrical shaft terminated by a cone. Between the lobes are two short fine hairs, and on the curve of the abdomen at each side are six or eight spines and from two to six oval pores. Ventrally there are five groups of spinnerets: upper group with 2 to 6 orifices, upper laterals 8 to 10, lower laterals 10 to 15. Dorsally there are great numbers of smaller spinnerets, which are congregated in large marginal groups on each segment of the thorax and abdomen, and are interspersed with small conical spines; and on the thoracic segments the spines are not only marginal, but extend in transverse rows across the body: there are also a few on the cephalic extremity. Moreover, on the dorsal surface there are six larger spines, one on each side at the level of the rostrum, and two on each side near the spiracles. The spiracles are rather large, and close to each is a group of four spinnerets.

Larva yellow, elliptical; length about $\frac{1}{60}$in. The dorsum is longitudinally corrugated. Antennæ of six joints, of the normal Diaspid form. The abdomen terminates with two moderate setæ.

Adult male unknown.

Hab. In Australia, on *Acacia pendula*. My specimens were sent by Mr. W. W. Froggatt, from Urana, New South Wales.

I believe this to be a quite distinct species, which I place in the genus *Mytilaspis* on account of the non-carinated male puparium. The abdominal extremity, the very numerous spinnerets and small spines, and the six large dorsal spines appear to be clear distinctions.

Mytilaspis convexa, sp. nov. Plate III., figs. 10–12.

Female puparium dirty greyish-white, somewhat expanded posteriorly, very convex: the second pellicle is generally so much raised up that its posterior edge forms quite a ridge over the secreted portion. Length of puparium averaging about $\frac{1}{23}$in.

Male puparium similar in colour to that of the female, convex, elongated, subcylindrical; not carinated. Length about $\frac{1}{25}$in.

Adult female of normal form; colour brown; length about $\frac{1}{30}$in. Abdomen ending in two median lobes, not adjacent, broadly rounded with short straight sides, the posterior margins very minutely serrulate. At each side, and separated from the median lobes by two spines, is a smaller broadly-rounded serrulated lobe. Margin of the abdomen broken by many small serrations, and bearing several short spines. No groups of spinnerets, and not many dorsal single orifices. The rudimentary antennæ are rather large.

Adult male unknown.

Hab. In Australia, on *Acacia* sp. Mr. Olliff sent me specimens from Sydney.

The non-carinated male puparium fixes the genus of this insect. The absence of spinneret-groups is abnormal. I think *M. drimydis*, Mask. (N.Z. Trans., vol. xi., 1878, p. 196), is the only other species with this peculiarity.

Mytilaspis grandilobis, sp. nov. Plate III., figs. 13, 14.

Female puparium snowy-white: the real form is elongated and mussel-shaped, or slightly pyriform; but it is frequently obscured by white cottony fluff. Length averaging about $\frac{1}{14}$in.

Male puparium snowy-white, semi-cylindrical, with parallel sides; not carinated; length about $\frac{1}{23}$in.

Adult female yellowish or orange; form normal of the

genus, with sometimes rather conspicuous segments. Length about $\frac{1}{20}$in. before gestation. Abdomen ending in a curve, broken by many minute serrations, near which are some large oval pores: on the margin are several longish spiny hairs, single, or in pairs, or in threes. There is a very slight median depression, and two very conspicuous median conical lobes not adjacent, with rounded tips and very minutely serrulated sides. There are five groups of spinnerets: upper group with eight to ten orifices; upper laterals fourteen or fifteen; lower laterals sixteen to twenty-four. There are many single dorsal spinnerets on every thoracic and abdominal segment, and on the margins of the same a few spiny hairs.

Adult male unknown.

Hab. In Australia, on *Banksia* sp. My specimens were sent by Mr. French from an unnamed locality near Melbourne. The male puparia were very numerous on the leaves sent. Many of the females had been parasitised, as shown by small round holes in the puparia, and the insects in these cases were swollen and deformed.

This species is very easily distinguished by the two large and conspicuous abdominal lobes, which are more prominent than in any others of the genus. The non-carinated male puparium fixes it in *Mytilaspis*.

Genus FIORINIA.

Fiorinia rubra, sp. nov. Plate III., figs. 15–18.

Female puparium really greyish or brownish-white, but on account of the large size of the second pellicle, which nearly fills it, only a small portion of the fibrous secretion is visible beyond the pellicles, and the whole has therefore a dark-orange or reddish appearance. The pellicles together are elongated-elliptical, and the fibrous secretion at their extremity is usually broadly rounded, the whole puparium seeming therefore rather broadly pyriform. Length averaging about $\frac{1}{30}$in. The second pellicle occupies nearly the whole of it.

Male puparium elongated, narrow, flattish, not carinated; distinguishable partly by exhibiting only one pellicle, partly by its greater length, which averages $\frac{1}{23}$in.

Adult female dark-orange, elongated; length about $\frac{1}{40}$in., rather less than that of the second pellicle. Abdomen terminating in two broad lobes, of which the inner margins are nearly straight and almost adjacent, the outer margins rounded, sloping outwardly, and minutely serrulate: at each side of them, and at only a short distance, is a smaller denticulate lobe. The abdominal margin is broken by many serrations, between which are several spines, about nine on each

side. There are no groups of spinnerets, but many single large dorsal orifices.

Adult male unknown.

Hab. In Australia, on *Acacia* sp. Mr. Olliff, of Sydney, who sent me the specimens, was only able to tell me that the tree in question is known by the name of "Raspberry-jam wood," and is a native of Western Australia.

This insect is not far removed from *F. grossulariæ*, Mask. (N.Z. Trans., vol. xvi., 1883, p. 123), but differs in having no groups of spinnerets.

Genus Poliaspis.

Poliaspis exocarpi, Maskell. N.Z. Trans., vol. xxiv, 1891, p. 17.

I have received specimens of this from Mr. French on *Santalum* sp. from Port Darwin, in the extreme north of Australia. Notwithstanding the difference of food-plant or of climate, I am unable to distinguish these insects from the original specimens received from Mordialloc, Victoria.

Group LECANINÆ.

Subdivision LECANIEÆ.

Genus Lecanium.

Lecanium (?) sp. Plate IV., figs. 1, 2.

Female insect (second stage ?) dark-brown in colour, with a redder tinge on the abdomen. Form elongated and proportionately narrow, convex, sub-cylindrical. Length about $\frac{1}{5}$in. Antennæ of six joints, of which the third is much the longest, and the sixth is rather longer than either the fourth or fifth; on the last joint are several hairs. Feet rather long and slender; the tarsus is rather longer than the tibia; on the extremity of the tibia are two hairs, and there is a long hair on the trochanter; the digitules are all fine knobbed hairs, the upper pair rather long. Abdomen tapering posteriorly, as if prolonged in two narrow processes, the ends of which almost touch each other, their internal margins forming the abdominal cleft, at the top of which are the usual lobes, rather large and long, and bearing short setæ; the anal ring appears to have several hairs. Mentum monomerous. Dorsal epidermis smooth, but the margins exhibit numbers of minute curved marks, interspersed with circular and tubular spinnerets and some small spiny hairs, which seem to be most numerous on the cephalic region.

Hab. In Australia, on *Casuarina* sp. My specimens were sent by Mr. Olliff, from Sydney.

I am not at all sure that any of my specimens (five) are

adult females. The six-jointed antennæ and the tarsi longer than the tibia are characters usually denoting an immature stage. Nor can I certainly fix them in the genus *Lecanium*. They greatly resemble, in their narrow subcylindrical form and in the convergent extremity of the abdomen, the figure of *Signoretia luzulæ*, Dufour, given by Signoret in his pl. viii., fig. 1 (pl. vi. of 1871). *Signoretia* in the adult stage constructs a very definite sac of white cotton, and the spinnerets and spines of the species now under discussion seem to point to a similar procedure. On the whole, I leave the insect for the present as a Lecanium, with the expectation that the full-grown form will be found to inhabit a sac; and I shall not be at all surprised if it should turn out to be a *Pulvinaria*.

Lecanium nigrum, Nietner, "Enemies of the Coffee-tree," 1861; Green, Ind. Museum Notes, 1889, p. 117, and pl. vii.; Douglas, Ent. Mo. Mag., April, 1891, p. 95. Plate IV., fig. 3.

Lecanium depressum, Targioni, Stud. sulle Coccin., 1867, and Catal., 1868; Signoret, Ann. de la Soc. Ent. Franc., 1873, p. 439 and pl. xiii.; Douglas, Ent. Mo. Mag., vol. xxiv., 1887, p. 27; Maskell, N.Z. Trans., vol. xi., p. 206, and vol. xxv., p. 220. Plate IV., fig. 4.

Lecanium begoniæ, Douglas, Ent. Mo. Mag., 1892, p. 209. Plate IV., fig. 5.

The first of these three has been reported from India and Demerara; the second from hothouses in Europe and New Zealand, from Australia, and from the Sandwich Islands; the third from Demerara. They are thus evidently natives of tropical, or at least hot, countries, and seem widely distributed.

I have arrived at the conclusion that they are all practically identical, or, at most, varieties of one species. Priority of nomenclature compels me to adopt *L. nigrum* as the type, although really no scientific description of that insect appeared before that of Mr. Douglas, in 1891. Nietner gives no details; and Mr. Green, though giving several figures, attaches thereto scarcely any description. On the other hand, Targioni, in 1867–68, is equally unsatisfactory regarding *L. depressum*; but Signoret gave sufficient details in 1873, and in reality deserves to be credited with the type. *L. begoniæ* is only described fully by Douglas.

I may observe that the remarks about to be made are founded on specimens received by me, of *L. nigrum* from Mr. Cotes, of *L. depressum* from Dr. Signoret, and of *L. begoniæ* from Mr. Douglas, so that I can have little doubt as to identification. Strictly, these observations ought to have been

made in my paper of 1892, when I reported *L. depressum* from Sydney and Honolulu, for I had then in my possession the same material, but having many other things to think of I overlooked the point.

The main reason why I consider the three insects named as belonging to one species is the character of the epidermal cells; and it is necessary to begin by quoting the expressions thereon of the authors mentioned, who have spoken of them. Previously, however, we may discard an external character referred to by Signoret—"Dorsum slightly elevated, with two small depressions in specimens from Italy, and two carinæ in specimens from France"—because evidently this is not a constant character. As regards the cells of the epidermis,—

Signoret says of *L. depressum*, "Exhibiting a great number of tessellated irregular plates forming a marquetry pattern; each plate has a darkish band round it, with a clearer but still rather dark surface-space, and a central clear space with a small orifice." And in his pl. 13, fig. 11*a*, he delineates the cells as irregularly polygonal.

Green, Targioni, and Nietner make no mention of the cells of the epidermis.

Douglas says of *L. nigrum*, "Under the microscope the whole surface is seen to be covered with a tessellation of closely approximate small yellow dots and punctures"; but he does not make any observation as to their form.

Douglas says of *L. depressum*, "Surface covered with a reticulation of irregular shallow cells with a pale centre or ocellus."

Douglas says of *L. begoniæ*, "Covered with contiguous, minute, oval, yellowish dots."

It seems clear here that Mr. Douglas agrees with Dr. Signoret as to the irregular form of the cells in *L. depressum*, but that he considers those of *L. nigrum* and *L. begoniæ* to differ in being more "dot-like" and oval. Indeed, he remarks that the two last insects seem to be very similar to each other.

But, on further consideration, it seems doubtful whether Mr. Douglas made any examination of the epidermis except an *external* one (that is, viewing the insect *in sitû*, without preparation) — for although, examined in this manner, a certain (though by no means a great) difference seems to exist between the cell-forms, yet closer observation by transmitted light shows that in reality they are identical. The cells of *L. nigrum* and *L. begoniæ*, which at first sight appear more or less oval, are then seen to be very clearly polygonal and irregular, and to form what Mr. Douglas says of *L. depressum*—a "reticulation." In some specimens of *L. begoniæ* I find the cells perhaps rather smaller than usual; but, as a rule, in all three insects the average (longest) diameter of a

cell seems to be about the same—$\frac{1}{500}$in. The outer band and the central orifice are visible in all. Perhaps the cells of *L. begoniæ* may be the darkest in colour.

Looking, therefore, at the epidermis, it appears sufficiently clear that the three insects are identical, whilst in size, colour, and generally convex form they also agree. Mr. Douglas, indeed, says that some of his specimens of *L. depressum* were greenish-yellow instead of brown; but the difference is not important.

With regard to the antennæ, I do not find any difference between *L. nigrum* and *L. depressum:* the figures given by both Signoret and Douglas agree, and so do my own specimens. Both have eight joints, of which the third is the longest. There is a difference, however, in *L. begoniæ*, where there are only seven joints. But Mr. Douglas specially remarks that in the fourth joint there is "a constriction simulating a joint," and this "false joint" (as I have called it in other Lecanids) seems quite enough to raise doubts as to any definite separation of the insect from the others.

As regards the feet, Signoret says of *L. depressum* that the digitules of the claw are dilated, and "one larger than the other." Douglas says nothing of the foot of *L. depressum*. As to *L. nigrum*, he says "digitules long, broad, much dilated"; and of *L. begoniæ*, "digitules normal." I have not been able to detect unequal digitules in *L. depressum*, and possibly Signoret's specimen was exceptional in that respect.

Taking, therefore, these important features—the epidermis, the antenna, and the foot—it seems fairly clear that there is no real difference between the three insects named—at least, as far as concerns the adult female. The females of the second stage appear to be equally similar. I have not observed the larvæ or the males, nor, I think, has anybody except Mr. Green, who gives figures of the adult male, and of its pupal waxy test, of *L. nigrum*. Possibly *L. begoniæ* may be erected into a variety on account of its antenna, and *L. depressum* on account of unequal digitules: but these are only very doubtful differences, and the three must be considered as really one species. Priority, as above-mentioned, determines that species to be *L. nigrum*, Nietner, although Signoret, who first gave anything like a scientific description, might be thought to have a claim for *L. depressum*.

Lecanium mori, Signoret. Maskell, N.Z. Trans., vol. xvii., 1884, p. 29; Scale Insects of N.Z., 1887, p. 82.

I reported this insect in 1884 on *Alsophila colensoi*, but did not give any detailed description. As it has been sent to me during the past year on various other ferns, and as Signoret in his original description (1873) made no mention of the larva

or the second stage, nor of the male, it is worth while to enter here into some particulars concerning the species.

Adult female reddish-brown, or sometimes dark-brown, the median dorsal region darker in colour than the margins; form elliptical, dorsum convex, margins slightly flattened; length averaging about $\frac{1}{9}$in., but specimens may reach $\frac{1}{5}$in. Antennæ of seven joints, of which the first two are short, the third and fourth longest and subequal, the fifth and sixth shortest and subequal, the seventh as long as the fifth and sixth together; on the first are two short hairs, on the second two long ones, on the third none, on the fourth four, on the fifth and sixth one each, and on the seventh several. Feet slender; the coxa bears two long hairs, the trochanter one very long; the tarsus is curved and nearly as long as the tibia; the digitules of the claw are rather dilated. Abdominal cleft and lobes normal. The margin of the body bears a row of fine hairs, and at each spiracular depression there are three or four strong spines with a group of circular spinnerets at their bases.

Second stage female yellow or light-brown, elliptical, flat, rather translucent; length about $\frac{1}{16}$in. Antennæ of six joints, of which the third is the longest; the last joint bears several longish hairs. The margin of the body has a row of fine hairs, as in the adult.

Larva yellow, flattish, elliptical, active; length about $\frac{1}{45}$in. There seems to be no particularly distinctive character about it, but the fine marginal hairs are present.

Adult male unknown; the male pupa inhabits a white, waxy, subelliptical test.

Hab. In Europe, on mulberry (if we may judge by the name); in New Zealand, on *Alsophila colensoi*, *Nephrolepis cordifolia*, *Asplenium flaccidum*, and other ferns.

Those who are inclined to separate species on account of external appearance, varying food-plants, or even locality, might attempt to distinguish the New Zealand specimens from the European ones; and, indeed, I have never seen this insect on mulberry, but always on ferns. But the anatomical characters of the antennæ and feet, in addition to the elliptical outline and dorsal convexity, are so absolutely identical in both that I cannot dissociate them. These characters, which led me in 1884 to attach the *Alsophila* scale to *L. mori*, are found precisely similar in 1893 on *Asplenium* and *Nephrolepis*.

Genus Pulvinaria.

Pulvinaria maskelli, Olliff, Agric. Gazette of New South Wales, vol. ii., p. 667; vol. iii., p. 176. *Signoretia atriplicis*, Maskell, N.Z. Trans., vol. xxiv., 1891, p. 23. Plate IV., fig. 8.

Although I find a few minute characters in my specimens of *S. atriplicis* which seem different from those of *P. maskelli* (the comparison being made between prepared specimens of both), yet on the whole I believe the two to be identical, and I shall therefore abandon mine, both generically and specifically, in favour of Mr. Olliff. The specimens which I first received came from Wentworth, New South Wales, on *Atriplex* sp., and were sent by Mr. French. There were about twenty adult females in the first parcel, and nearly as many more in a second. All of these were so much covered with cotton that I could not decide upon attaching them to the genus *Pulvinaria*, in which the insect is usually exposed at one end of a cottony ovisac. The only difference between *Pulvinaria* and *Signoretia* lies in this arrangement of the cotton, and may be paralleled perhaps by the distinction drawn between *Eriococcus* and *Gossyparia*. Mr. Olliff, who received his specimens (more numerous than mine) independently from the same locality and on the same plant, attached them to the genus *Pulvinaria*, and in his figures shows the insect exposed at the end of an ovisac. The specimens also which he has sent to me are quite clearly exposed, and are *Pulvinaria*.

It will be seen from the description to be given presently of *Pulvinaria tecta* that specimens of that insect are frequently so covered with cotton as to be invisible, whilst others are exposed. I have seen also sometimes, but not often, insects of *P. innumerabilis*, Rathvon, and *P. betulæ*, Linn., almost, if not quite, covered.

As regards the differences mentioned above between my specimens and those of Mr. Olliff, I find them to be such as the following: In mine the last female antennal joint is less than the seventh, and the joints of the foot bear no hairs; in Mr. Olliff's the last joint is longer than the seventh, and the feet have a few hairs. For the males mine have the abdomen shorter than the spike, and the tibia is much less than three times as long as the tarsus; while in Mr. Olliff's the abdomen is longer than the spike, and the tibia is more than three times the length of the tarsus. These microscopic differences may be considered as indefinite. In my paper of 1890 (Trans., vol. xxiii., p. 32) I remarked that a student of Coccids "must be prepared at any time to find distinct departures from generic types, and to consider any character whatsoever as elastic and variable." In view of the locality in which both sets of specimens were collected, and of the identity of the food-plant, I shall consider my species identical with that of Mr. Olliff.

A somewhat embarrassing point arises, however, as to nomenclature. The paper in which I reported *Signoretia atriplicis* was read in October, 1891, while Mr. Olliff's descrip-

tion appeared in November of the same year. Circumstances made it impossible for my paper to be printed before May, 1892, and in the technical sense of publication I suppose Mr. Olliff has priority. Had he not attached my name to the species nothing need now be said; but, whilst quite appreciating the honour thus done me, I must venture to ask whether the proper name of the insect should not be *Pulvinaria atriplicis?*

Pulvinaria maskelli, Olliff, var. **spinosior,** var. nov. Plate IV., figs. 6, 7.

Insects forming a white, cylindrical, narrow ovisac, which sometimes attains a length of $\frac{1}{2}$in., with a width of scarcely $\frac{1}{8}$in. This ovisac is very finely striated or corrugated transversely.

Adult female dark-brown or red-brown, placed at one end of the ovisac and raised up *a tergo*. The normal form before gestation is elliptical, and the length about $\frac{1}{5}$in. to $\frac{1}{4}$in., but at gestation it becomes much shrivelled and wrinkled, and therefore considerably smaller. The median dorsal region is somewhat convex, the margins a little flattened. Antennæ of eight joints, of which the third is much the longest, the sixth seventh and eighth the shortest and subequal. There is a longish hair on each of the first and second joints, and several shorter ones on the others, especially on the eighth. Feet rather strong, with several hairs on each joint; tarsal digitules long knobbed hairs, digitules of the claw very widely dilated. Epidermis bearing many small slender tubular spinnerets. On the margin of the body there is a row of conspicuous, rather thick, longish spines, and these may sometimes in life be seen to bear short waxy tubes. Abdominal cleft and lobes normal. Mentum apparently monomerous; rostral setæ short.

Second stage not observed.

Larva red, flattish, elliptical, slightly tapering posteriorly, active: length about $\frac{1}{45}$in. Antennæ of six subequal joints, the sixth bearing several hairs, of which one is very long. Feet slender: the digitules are all fine hairs. Abdominal cleft and lobes normal, terminal setæ very long: between the lobes is in life a short pencil of white cotton on short hairs, and on being slightly pressed the abdominal extremity protrudes in a circular reticulated form. On the margin of the body is a row of short conical spines: the four spiracular spines are rather long.

Male unknown.

Hab. In Australia, on *Frenela (Callitris) robusta*, the "Murray Pine." My specimens were sent by Mr. French, who received them from Mrs. A. Molineaux, of Adelaide, but the exact locality was not named. The tree is a native of South Australia.

This species is so very closely allied to *P. maskelli*, the "saltbush scale," from Wentworth, New South Wales, that I cannot consider it as more than a variety, and even that only doubtfully. The differences are in the narrowness and proportionate length of the ovisac and the larger and more conspicuous spines on the margin of the adult female; and the former of these may simply be due to the character of the plant on which the insect lives. Mr. Olliff, in his account of *P. maskelli*, does not mention any waxy tubes as springing from the marginal spines of that species in life.

Pulvinaria tecta, sp. nov. Plate IV., figs. 9–14.

Adult female producing a quantity of white, or slightly yellowish, cotton, which forms a more or less globular mass, frequently reaching a diameter of more than $\frac{1}{3}$in., but often many of these are aggregated in a large mass, covering the twigs very thickly. It is difficult at first sight to detect the insect, which seems almost entirely covered by the cotton, but on careful scrutiny it may be discovered partially embedded, or even sometimes almost fully exposed. The cotton is full of eggs and larvæ.

Female insect varying in colour from reddish-brown to greenish or yellowish brown. Form elongate-elliptical, slightly concave beneath and convex above, with often a longitudinal median dorsal carina. There is frequently a slight constriction on the cephalic region, rather anterior to the rostrum. Abdominal cleft normal, the dorsal lobes rather small. Antennæ slender, of eight joints, of which the two first are short and wider than the rest, the sixth and seventh very little longer and slender, the third fourth and eighth the longest and subequal. The second and fifth joints bear each one long hair; the eighth has several moderately long. The feet are slender, the tibia very little longer than the tarsus: the tarsal digitules are long fine knobbed hairs, the digitules of the claw usually the same, sometimes a little dilated. The anal ring bears several hairs. On the margin of the body is a row of moderately-long blunt spiny hairs. The epidermis is often marked with numbers of small oval clear spots, which are not visible until after treatment with potash. The dorsum is covered with a pubescence of very short fine hairs. Length of insect averaging $\frac{1}{5}$in. before gestation.

Second stage not observed.

Larva red, or yellowish-red, flattish, elliptical, active: length about $\frac{1}{40}$in. Antennæ slender and rather long, of six joints, the first two very short, the third and sixth the longest: on the last joint, besides the ordinary hairs, is one very long and another rather less so. Abdominal cleft conspicuous; the lobes small, each bearing a long seta: between the lobes are a

few short fine hairs which bear a pencil of white cotton, and on being very slightly pressed the extremity of the abdomen protrudes in a circular reticulated form, as shown in the figure.

Male unknown.

Hab. In Australia. My first specimens were sent by Mr. Olliff, on a twig of orange, from Sydney; a second lot came from Mr. Froggatt, on *Acacia* sp., also from Sydney; and later, Mr. French sent me some on *Daviesia corymbosa*, from Anderson's Creek, near Melbourne. The cotton on the Sydney specimens is pure white, and that from Melbourne tinged with yellow: the insects otherwise agree.

The appearance of this species, or rather of its cotton, is somewhat striking, as it is very thick and abundant, and covers the twigs profusely. I cannot say that it entirely corresponds with the usual type of *Pulvinaria*, because it is by no means easy to distinguish clearly the insect, so much is it surrounded by the cottony mass; yet I cannot declare that it is entirely embedded. If it were so, it would probably have to be placed in the genus *Signoretia;* but it seems to suit *Pulvinaria* best. It is another instance of a species on the borderline of two genera.

Genus Signoretia.

Signoretia atriplicis, Maskell. N.Z. Trans., vol. xxiv., 1891, p. 23.

I have already remarked above (see genus *Pulvinaria*) that this appears to be identical with *P. maskelli*, Olliff, and the species has to be abandoned.

Signoretia luzulæ, var. **australis**, Maskell. N.Z. Trans., vol. xxv., 1892, p. 223.

I have been able, since reporting this insect last year, to examine further specimens, and can maintain its specific and generic position, although from the size of the sac and a few minute differences it may receive rank as a variety.

The Group **Hemicoccinæ**, Mask., and the genera **Asterolecanium** and **Planchonia.**

During the year 1892 I received from Mr. Olliff, of Sydney, some specimens which, after close examination, I place in the genus *Kermes*, and, as this is the first species of this genus which I have had occasion to describe in detail, I venture to repeat here the characters ascribed to the group *Hemicoccinæ* in my paper of 1883 (N.Z. Trans., vol. xvi.) and in my "Scale Insects of New Zealand," 1887:—

Adult females exhibiting the anal cleft and the lobes of Lecaninæ: naked or covered.

Larvæ presenting at the extremity of the abdomen the anal tubercles of Coccinæ.

From the foregoing characters the group is very evidently intermediate between Lecanids and Coccids.

When, in the years just mentioned, the formation of this group was proposed, I possessed specimens of three out of the eight species of the genus *Kermes*, which forms part of it: *K. vermilio*, Planchon; *K. bauhinii*, Planchon; and *K. galliformis*, Riley. Since then I have received from Mr. Newstead an African species, *K. quercûs*, Newst., ms., and now have another from Australia, which I propose to name *K. acaciæ*.

In 1883 I attached to the group the two genera, *Asterolecanium*, Targioni, and *Pollinia*, Targioni; and in 1881 (following Signoret) I had placed *Planchonia*, Sign., among the Coccinæ. Previously all these three genera had been included amongst a Lecanid section to which Targioni had given the name "Lecaniodiaspidæ." This name appeared to me to be so singularly inappropriate, seeing that none of the genera placed under it had any Diaspid character, and that their larvæ were certainly not Lecanid, that I declined to continue so confusing an arrangement; I placed under the Lecaniodiaspidæ such genera as *Ctenochiton*, *Ceroplastes*, &c., which fitted it, and divided the others according as their characters seemed to direct. One genus, *Lecaniodiaspis*, Targioni, I was obliged to leave alone, knowing nothing about it, nor do I know if anybody has ever since seen it.

The exigencies of my book on "Scale Insects of New Zealand," in 1887, unfortunately compelled me to extreme brevity. The work was intended primarily for the use of settlers in the colony, and much scientific detail would have been out of place: as it was, the book was scarcely published before I was told "there was too much Latin in it." Some friends of mine who of late years have taken up the study of Coccids, and who have had occasion to touch upon some of the genera just mentioned, have not given me credit for at least thinking there was some good reason for my action. My papers of 1881 and 1883 have been ignored, and my classification set aside, probably because in 1887 it was not reasoned out in detail. The old Lecaniodiaspidæ, including *Planchonia* and *Asterolecanium*, have been made to do duty still. The larval form of *Asterolecanium* has been unnoticed; the anal tubercles present in all stages of *Planchonia* have not been considered; and the confusion introduced by Targioni in 1868 has been perpetuated without discussion of important points. Mr. Ashmead, in his "Generic Synopsis of Coccidæ," 1891, adheres to Targioni's system: he is followed by Mr. Cockerell in "Science Gossip," 1893; and neither writer pays any attention to the anatomical characters of the insects. "Priority of authorship" has been

taken as sufficient; the "rules of nomenclature," said to be binding on all zoologists, have been made to override common-sense, clearness, and convenience. I must demur to this, and cannot agree to leave in the Lecaniodiaspidæ genera which are not at all Diaspid nor in all stages Lecanid.

Signoret (Ann. de la Soc. Ent. de France, 1868, p. 82) says of the adult *Asterolecanium miliaris*, "This species is clearly Lecanid, the anal extremity being cleft, with anal lobes"; and he further remarks that it closely resembles *A. bambusæ* and *A. aureum*. In my paper of 1883 I drew attention to this point, stating very clearly that it prevented me from treating *Asterolecanium* like *Planchonia*, and placing it among the Coccids. But Signoret also states that the larva of *A. aureum* and the larva of *Pollinia costæ* have the anal tubercles of Coccids; consequently it seemed to me equally impossible to leave these genera amongst the Lecanids proper, and so, in 1883 and 1887, I grouped *Pollinia* and *Asterolecanium* with *Kermes*.

Professor Targioni has, I believe (although I have not seen his paper), lately, in 1893, made further observations on *Asterolecanium aureum*, and concluded that it is really a *Planchonia*. If that is so, it must have the anal tubercles of a Coccid. Possibly it may be found some day that *A. miliaris* and *A. bambusæ* are in like position. As to *A. quercicola*, I have long had doubts about it, and, indeed, whenever anybody has sent me specimens under the name of *Asterolecanium* I have always found them turn out to be *Planchonia fimbriata*, Fonscol. Perhaps, therefore, the whole genus may have to be abandoned some day, and *Pollinia* and *Lecaniodiaspis* may share the same fate. But (and this is the important point for the present) until Signoret's statements quoted above remain uncontradicted there is a genus, in which the larva is Coccid and the adult is Lecanid, called "*Asterolecanium*," and this must therefore be placed in a group with *Kermes*, intermediate between Lecanids and Coccids. *Planchonia* is altogether Coccid. The two genera must therefore be separated, and under no possible conditions can either of them be placed with the *Lecanio-diaspinæ*. Reasoning such as this I believe to be the only true basis of proper classification, and on it I have founded my own system since 1881.

To sum up: *Asterolecanium* must remain with *Kermes* and include (at present) *A. miliaris* alone, or possibly also *A. quercicola*, though this is very doubtful. *A. aureum* and probably *A. bambusæ* must be attached to *Planchonia*, and in all likelihood to *P. fimbriata*. If, hereafter, *A. miliaris* and *A. quercicola* are found to be clearly Coccid, then *Asterolecanium* will disappear altogether. As for any fancied "priority" which the name may be supposed to have over *Planchonia*,

that may be entirely disregarded, because it would be, as a generic name in the Coccid group, misleading and nonsensical. Formal fetters must not bind reasonable beings too tightly.

Genus Kermes.

Kermes acaciæ, sp. nov. Plate IV., figs. 15–18.

Adult female dull dark-red, with a yellowish tinge; almost globular, with a small orifice beneath for attachment to the plant. Antennæ and feet entirely absent. Abdominal cleft nearly obsolete, but distinguishable by a small cut in the edge of the basal orifice, extending as a shallow, narrow depression a short distance along the dorsum until it ends in a minute black spot. At this spot there is a very small orifice with two very minute lobes. The epidermis is somewhat wrinkled, and externally appears smooth. After treatment with potash it is found to be covered with great numbers of minute conical-pointed pustules set close together. I am not quite satisfied that these curious appendages are not on the inner surface only of the skin. In various spots, also, the epidermis is evidently thickened, although on the external surface no ridges are noticeable. Diameter of the insect averaging about $\frac{1}{5}$in.

Female of the second stage semi-globular, yellow or brown. Diameter about $\frac{1}{16}$in. My specimens are not in sufficiently good order for minute examination.

Larva yellowish-brown, active, flattish, elliptical: length about $\frac{1}{70}$in. Abdomen ending in two conspicuous anal tubercles, each bearing a long seta and two spines. Antennæ of six short joints, subequal, the last bearing several hairs, of which one is very long. Feet moderate, the tibia shorter than the tarsus: digitules fine hairs. On the head, between the antennæ, are four short hairs, and on the margins of the body a row of conical spines. The anal ring appears to have six hairs.

Hab. In Australia, on *Acacia* sp. My specimens were sent from Sydney by Mr. Olliff.

I have marked this as a new species, although in some of its characters it resembles *K. vermilio*, Planchon, and *K. bauhinii*, Planchon, both European insects. Yet it differs from both. *K. vermilio* is supposed to be the representative of the insect which, under the name of *Kermes*, or *Coccus ilicis*, produced in former times a rich-red dye. *K. acaciæ* differs in failing (as far as I can judge) to produce any colour, either in alcohol or in potash; also, the posterior extremity of the larva has more prominent tubercles than *K. vermilio*. On the other hand, it differs from *K. bauhinii* in colour, that species being jet-black; but the larval tubercles are similar: but *K. bauhinii* preserves its feet and antennæ. In external colour, in size, in the absence of feet and antennæ, and in the

spines and hairs of the larva, *K. acaciæ* resembles *K. vermilio*, and if the tubercles were less distinct, and it produced a dye, I should consider it as perhaps a variety of that species. For the present I leave it as distinct, mainly on account of the conical pustules of the epidermis, which are entirely absent from my specimens of *K. vermilio*, sent me in 1881 by Dr. Signoret.

Group COCCINÆ.

Subdivision ACANTHOCOCCINÆ.

Genus Planchonia.

Planchonia bryoides, sp. nov. Plate V., figs. 1–9.

Adult female covered by a test which is, for the main portion, composed of convex, yellow, elliptical, nearly smooth and homogeneous wax, on which is usually a thin layer of white granular particles; but there is a marginal fringe of triangular segments, rather wide at the base, and pretty long, usually of a pink or red colour, and these segments frequently also extend over the dorsal region, so that the test has the appearance of a small pink, or whitish, patch of moss; there is, besides, frequently a quantity of black fungus obscuring the whole. The resemblance to reddish moss is often so striking that the thing may easily at first sight be taken to be vegetable; but in many cases the median dorsal smooth yellow wax is visible with only a marginal triangular fringe, and indeed it can always be detected by close observation. There is a small orifice at the posterior end of the test, and the triangular segments on the dorsum seem to be always directed away from it. In the earliest adult stage the test is elliptical, prolonged at the cephalic end in a more or less sharp point: the leaf-like processes appear afterwards. The average length of a test, including the fringe, is about $\frac{1}{13}$in.

Test of the second stage elongated, convex, elliptical, orange-coloured above, flat and reddish beneath. There seems to be no fringe.

Test of male waxy, semi-cylindrical, yellow or pinkish. Length about $\frac{1}{16}$in.

Adult female brown, pegtop-shaped, with abdomen prolonged in a very short conical "tail," which is terminated by two small anal tubercles, each of which bears a long seta. The anal ring, which is situated just above the tubercles, seems to have six short hairs. Antennæ and feet absent. Epidermis covered with great numbers of double or figure-of-eight spinneret orifices: these are of two distinct sizes, and I do not know whether perhaps the larger may secrete the triangular leaf-like processes, while the smaller form the smooth dorsal wax, for the larger ones are rather more numerous near

the margins. The insect at first fills the test, but shrivels at gestation.

Female of the second stage not observed.

Larva brown, elongated, elliptical, slightly tapering posteriorly; the abdomen is conspicuously segmented, and ends in two conspicuous anal tubercles bearing long setæ. Antennæ of six joints, of which the third is the longest, the last three short and confused: indeed, I am not sure that there may not be seven joints. Feet offering no distinctive character. The whole dorsum bears transverse rows of large figure-of-eight spinnerets. A larva extracted from the body of the mother is very soft and whitish, with a length of about $\frac{1}{60}$in.; after emergence it becomes darker, and attains $\frac{1}{50}$in.

Adult male unknown.

Hab. In Fiji. My specimens were sent to me by Mr. R. L. Holmes, of Bua, on pieces of bark of some plant of which he did not give me the name.

This is certainly an elegant little species, and from its leaf-like processes the name which I have attached to it seems to be appropriate. I think it a good instance of the absurdity of including such genera as *Planchonia* amongst the "*Lecaniodiaspidæ*," as there is not the slightest Lecanid or Diaspid character about it.

Planchonia fimbriata, Fonscolombe.

Boyer de Fonscolombe, in 1834 (Ann. de la Soc. Ent. de France), described, under the name "*Coccus fimbriatus*," an insect which Signoret, in 1868, attached correctly to the genus *Planchonia*. Since then several species of that genus have been reported from different countries and on different plants. My studies of actual specimens, and of the published descriptions of authors, lead me to the conclusion that, with the exception of *P. bryoides*, just described (which is markedly distinct), they all really constitute one species, with perhaps some varieties, differing principally in the external colours. The synonymy of the species will therefore be as follows, giving Fonscolombe the priority as regards the specific name:—

P. fimbriata, Fonscol., 1834 = *P. (Asterolecanium) quercicola*, Bouché, 1851 (perhaps): = *P. arabidis*, Lichtenstein, 1876 = *P. hederæ*, Licht., 1880. Test yellow, fringes white or pinkish.

P. fimbriata, var. *epacridis*, Maskell, 1881. Test partly green, partly yellow; fringes white.

P. fimbriata, var. *styphelicæ*, Maskell, 1891. Test whitish, or with a greenish tinge; fringes white or pink.

P. fimbriata, var. *pustulans*, Cockerell, 1893 = *P. oncidii*, Cockerell, 1893. Test yellow or greenish-yellow; fringes pink or whitish-pink.

I have not yet been able to examine specimens of *arabidis* and *hederæ*, but in the descriptions I can see nothing to distinguish them from the type. As for *P.* (*Asterolecanium*) *quercicola*, I believe it to be identical with *P. fimbriata* from two specimens which I possess, but have already remarked on this point in the present paper.

Size is of very little or no importance. The var. *pustulans* is possibly usually larger and var. *epacridis* smaller than the type, but I lay no stress on this.

The anatomical characters of the females of all these insects are identical in all stages. All are without feet and antennæ, and all have marginal rows of figure-of-eight spinnerets. The only adult male yet described is that of var. *styphelicæ*. It is of course possible that future discovery may detect such differences in the males as may induce specific separation, but I doubt it, because the differences amongst males of a genus are very seldom important or clear.

Since writing the above I have received from Sydney, on *Leptospermum*, some specimens of the second stage of var. *styphelicæ*. These entirely confirm the view just taken, as I can see nothing in them sufficiently valid for specific separation from the type or from the var. *epacridis*.

Subdivision DACTYLOPINÆ.

(Comparison with *Acanthococcinæ*. Plate V., figs. 10–22.)

In vol. xxv. of the Transactions, 1892, p. 232, I described, under the name of *Dactylopius nipæ*, an insect from Demerara on *Nipa fruticans*. Mr. Newstead had received, unknown to me, specimens of the same species, and has published a description of it in the Entom. Monthly Magazine, August, 1893. I shall presently notice two or three small discrepancies between the two accounts of the insect; but one of them raises a point on which it may be useful to make a few remarks on the *Dactylopinæ* in general.

The distinction which, partly following Signoret, I have always drawn between the subdivisions *Acanthococcinæ* and *Dactylopinæ* is based upon what I believe to be the true scientific method of Coccid classification—namely, anatomical features. It depends principally upon the characters of the antennæ, the anal ring, and the anal tubercles of the adult female. In my paper of 1891 (N.Z. Trans., vol. xxiv., p. 30) I drew attention to one feature of the antennæ which might be very useful as a guide to students; and in my "Scale Insects of New Zealand," 1887, pl. ii., I gave characteristic figures of anal rings in the two subdivisions. There is therefore no need to enter now again into a discussion of these

points. But, with regard to the anal tubercles, the remarks of Mr. Newstead (*loc. cit.*) lead me to treat these organs with some detail.

After stating that in *D. nipæ* the tubercles are "very large," he says, "in the form of the antennal joints it is clearly Dactylopid, but the very conspicuous anal lobes are abnormal." I do not think so, for reasons to be mentioned presently.

In absolute strictness, I suppose that we ought not to look upon the tubercles of, say, *Eriococcus* and *Dactylopius* as morphologically distinct at all. In both cases they seem to be only processes visible on each side of the abdominal extremity, near to the anal ring; and they always bear a more or less numerous arrangement of hairs or spines. Carrying this view a little further, we might say that they correspond sufficiently with the abdominal lobes of the Lecanids. But, when we come to attempt a clear and convenient classification, we find that the forms possessing antennæ with short terminal joints and anal rings with eight hairs exhibit almost always tubercles differing considerably from those of the forms with long terminal joints and anal rings with six hairs. Absolute and severe uniformity is not to be expected when we are dealing with Coccids; yet the rule is as just stated. After nearly twenty years of experience, during which I have examined many hundreds of specimens of both kinds, I cannot say that there is any real difficulty in separating them. Some of the *Acanthococcinæ—e.g.*, *Rhizococcus casuarinæ*, Mask., or *Eriococcus turgipes*, Mask.—have comparatively small tubercles: some Dactylopids—*e.g.*, *Dactylopius nipæ*, Mask., or *Ripersia fagi*, Mask.—have comparatively large ones: but there is no mistaking their character. *Ripersia fagi*, Mask., is one of the Dactylopids I know of with perhaps the largest tubercles: *Rhizococcus grandis*, Mask., has perhaps the smallest tubercles of the Acanthococcids. Yet there is a very long way between the two.

The form of the tubercles in a Dactylopid is usually rounder and less cylindrical than in an Acanthococcid; their spines and setæ, where present, are more scattered; and the margins are less irregular. As a rule, also, they appear to be less chitinous. After treatment with potash (as described in my paper of 1891, p. 3), it will usually be found that the feet, antennæ, and rostrum of a specimen remain of a much darker colour, with more solid appearance, than the rest of the body; so also do the abdominal lobes of a Lecanid and the anal tubercles of an Acanthococcid; but the tubercles of a Dactylopid seem generally to be less hard. There are exceptions, as in *Ripersia fagi*, where the tubercles remain slightly darker than the body, but these are few. Even in *Eriococcus*

turgipes the tubercles, though small, are conspicuously dark and hard.

Some Dactylopinæ have the anal tubercles reduced nearly to a mere dot; in others they seem altogether obsolete. Examples may be seen in *Dactylopius adonidum*, *D. calceolariæ*, *Ripersia tomlinii*, *Pseudococcus asteliæ*, &c., and perhaps the time will come when somebody will separate under new subgenera the species with very minute from those with more noticeable tubercles.

The tubercles of *D. nipæ* are fairly large for the genus, and they approach those of some *Ripersiæ*; and it was partly on this account (in addition to the cottony processes) that in 1892 I stated that it might almost be a *Ripersia*, if other characters did not forbid it. I cannot detect any Acanthococcid feature in the insect. The figures which are given in Plate V. with this paper will illustrate the differences of anal tubercles just mentioned. They are taken at random from specimens in my possession, and are drawn on the same scale for comparison.

Dactylopius nipæ. Maskell, N.Z. Trans., vol. xxv., p. 232; Newstead, Ent. Mo. Mag., Aug., 1893, p. 187. Plate V., fig. 19.

The differences between the characters of this insect as given by Mr. Newstead and myself may be tabulated as follows:—

Newstead.	Maskell.
Antennæ always with seven joints.	Antennæ seven or eight joints.
Digitules of the claw slender.	Digitules of the claw slightly dilated.
Rostrum (mentum) dimerous.	Rostrum (mentum) trimerous.
Anal tubercles very large.	Anal tubercles very minute.

The first two of these may be considered as of no importance, being frequently variable.

As regards the third, I have re-examined three specimens, nd in all I find the mentum trimerous.

On the fourth character I have just made in the last few pages some detailed observations. I consider the tubercles of *D. nipæ* fairly large for the genus, but certainly extremely minute and inconspicuous as compared with those of any Acanthococcid.

Dactylopius bromeliæ, Bouché. Signoret: Annales de la Soc. Ent. de France, 1874, p. 310. Bouché: Naturgesicht, 1834, p. 20. Plate VIII., figs. 15, 16.

Adult female pale reddish-brown, elliptical, acuminate in front, slightly convex, active, segmented; length about $\frac{1}{12}$in. Dorsally there is a slight covering of white meal, and on the margins are, probably, some short cottony processes. Antennæ of eight joints, of which the second and third are equal, and longer than the fourth, fifth, sixth, or seventh; the eighth

is about equal to the fourth, fifth, and sixth together; the hairs on the joints are short. Feet having the tibia twice as long as the tarsus; digitules fine knobbed hairs; the hairs of the foot are longer than those of the antennæ. Epidermis bearing great numbers of circular spinnerets interspersed with spiny hairs. Anal tubercles very minute, with long setæ; anal ring compound, with six long hairs.

Hab. In India, on mulberry. Mr. Cotes has sent me specimens without definitely naming a locality; he only says that it is prevalent in the silk districts of Bengal.

I have been particular in giving some of the characters of this insect, because it has not hitherto been reported, except by Signoret and Bouché. The former had it on *pine-apple* from Zanzibar; the latter on *Canna*, *Hibiscus*, *&c.*, probably from South America. I am unable to say whether in Bengal the mulberry may be its proper food, or whether it migrated to that tree from tropical plants growing in the neighbourhood. My specimens correspond so very nearly with the description given by Signoret that I am compelled to identify them as *D. bromeliæ*. There is an insect described by Mr. Douglas (Ent. Mo. Mag., July, 1889, p. 317), under the name *D. theobromæ*, which seems to be also exceedingly near this species; but there are a few differences in the antennal joints which may separate it, though I incline rather to consider it as a variety only.

Dactylopius calceolariæ, Maskell.

I have received from the Rev. Mr. Colenso, of Napier, specimens of this insect, surrounded by much cotton, on leaves of *Cordyline australis* at that place. Mr. Colenso informs me that they are doing much damage to the trees, which are of large size. The insects affect chiefly the bases of the leaves, where, on account of their sheltered position, it would be difficult to get at them.

Mr. Cockerell has sent me a drawing of the foot of a *Dactylopius* found on sugar-cane in Northern Mexico which exactly corresponds with the foot of *D. calceolariæ*. I see no reason why the species should not be identical, as I reported *D. calceolariæ* on sugar-cane from Fiji in 1889.

Dactylopius poæ, Maskell.

Mr. W. Smith, of Ashburton, has sent me specimens of this species taken from ant-nests at Mount Somers, Canterbury, but I am inclined to think that their habitation was merely an accidental one. There are four known subterranean Dactylopids in New Zealand—*Dact. poæ*, *Dact. arecæ*, *Ripersia rumicis*, and *Ripersia formicicola*. Only the last of these seems to be connected specially with ants—at least, it is the

only one of which it is stated that the ants when disturbed carry it away for shelter with their own eggs. In the case of the others, I take it that, living as they do naturally underground, they would sometimes be found close to or within an ant's nest amongst the roots of plants.

Dactylopius eucalypti, Maskell.

Mr. Tepper, in the South Australian publication, "Garden and Field," November, 1892, says that this species in that part of Australia is on *Eucalyptus rostrata*, not on *E. amygdalina*, which is apparently not a South Australian tree.

Dactylopius affinis, sp. nov. Plate VIII., figs. 17, 18.

Adult female pinkish or yellowish, without any dark dorsal band, powdered with thin white meal on the dorsum; form elliptical, rather flat, distinctly segmented; length from about $\frac{1}{8}$in. to $\frac{1}{7}$in. At each side of the body are a number of projecting cylindrical slender cottony filaments, the length of which varies in different specimens. Sometimes these are very short and scanty, at others nearly half as long as the width of the body. Two on the cephalic extremity are always the shortest, and two on the abdominal extremity are always the longest, with a short pencil of cotton between these last. At gestation the insect forms a small thin white posterior ovisac.

Antennæ of eight joints, of which the eighth is the longest, then the third, second, and first; the fourth, sixth, and seventh are the shortest and equal to each other; the fifth is longer than the fourth, and nearly as long as the first. All the joints bear several hairs. Feet moderately long and slender, very slightly pubescent; tarsus scarcely more than a third of the length of the tibia; digitules four, slender. Mentum conical, dimerous. Epidermis bearing a few minute hairs and a number of small circular spinnerets. Anal ring compound, with six hairs. Anal tubercles small and inconspicuous, setiferous, and bearing several glandular pores.

Larva yellow, elongated, flattish, active; length about $\frac{1}{33}$in. Antennæ of six joints, the first five short and subequal, the last as long as any three others. Feet moderate; the tibia shorter than the tarsus. Anal tubercles inconspicuous. Mentum conical, dimerous. Eyes conspicuous, brown.

Male unknown.

Hab. In Australia, on tubers of *Dahlia* and potato, underground. Specimens sent by Mr. Olliff, from Sydney.

It has been necessary to enter into minute details of the structure of this insect, as in many respects it is very closely allied to known species. It is very near to *D. adonidum*, Linn.; *D. citri*, Boisduval; *D. cyperi*, Sign.; *D. pteridis*, Sign.; *D. vitis*, Nicdielski; *D. longifilis*, Comstock; and others.

But the proportions of the antennal joints and of the feet have been taken as the distinguishing features of the above-named species, and none of them agrees with *D. affinis*. Thus, in *D. adonidum*, the second and third joints are equal, and the fifth is shorter than the sixth; in *D. citri* the antennæ are somewhat similar, but the tarsus is almost as long as the tibia; and so on. Moreover, the habits of all these insects are aerial, whereas *D. affinis* appears to be, at least principally, subterranean. At some future time it may be found advisable to unite, under the common designation of the "mealy-bugs proper," all the insects of this genus presenting a fringe of cottony processes, and make them varieties of *D. adonidum*. But for the present they may remain separate.

Dactylopius lobulatus, sp. nov. Plate VI., figs. 1–3.

Adult female yellowish-brown or sometimes reddish-brown, covered dorsally with white cotton, and having a marginal fringe of white cottony processes which are somewhat longer on the abdominal segments. Length variable; the specimens seen average about $\frac{1}{11}$in. Antennæ of eight joints, of which the last is fusiform and the longest, the sequence of the rest being second, third, sixth, fourth, fifth, seventh, first. Feet rather long; femur strong; trochanter bearing one long hair; tibia cylindrical, with several fine hairs, and with two spines at the extremity; tarsus tapering, pubescent; the tibia is two and a half times as long as the tarsus; upper digitules short fine hairs, the lower pair only very short fine bristles lying along the claw. Mentum conical, dimerous; the abdomen is truncate, and terminates in four inconspicuous anal tubercles, each bearing conical spines and short setose hairs; anal ring large, compound, with six hairs. Epidermis bearing some very small circular spinnerets and some short fine spiny hairs: the spinnerets and hairs are more numerous near the margins.

Larva and male not observed.

Hab. In Australia, under loose strips of bark of *Eucalyptus globulus*. My specimens were sent by Mr. Froggart from Bendigo, Victoria. *E. globulus* is a Tasmanian tree.

This insect belongs to the series of *D. adonidum*, and may be distinguished from that species and from *D. affinis* chiefly by the proportions of the antennal joints and by the anal tubercles. These last are not conspicuous in the natural state, appearing only as small rounded bosses on the margin (just as in *D. nipæ*, *D. cocotis*, *D. albizziæ*, &c.), but after preparation of the insect they preserve a dark solid appearance, being seemingly more chitinous than the rest of the body. I have already remarked upon a similar feature when treating above of *D. nipæ*. Very possibly *D. lobulatus* may hereafter

take rank only as one of the many varieties which may be attached to *D. adonidum*.

Subdivision IDIOCOCCINÆ.

Genus Sphærococcus.

Sphærococcus leptospermi, sp. nov. Plate VI., figs. 4–14.

Insects inhabiting woody galls, which are merely swellings of the twigs of the plant. These galls vary in size (in the specimens seen) from $\frac{1}{3}$in. to 1in. in length, and from $\frac{1}{4}$in. to $\frac{1}{2}$in. in thickness, apparently according to the size of the twig they are on. In young unharmed specimens the gall, though rough like the tree-bark, is usually closed and firm all round, but when old or parasitised there is a longitudinal slit on one side, and the adjacent parts of the gall are soft and rotten. Frequently one of these old galls will have in it many large parasitic (seemingly dipterous) grubs. In a few cases I have found two adult female Coccids inhabiting the same gall.

The interior of the gall is smooth, with a layer of white cotton, which is usually very thin, but which in some specimens becomes rather thick, and forms a sort of cushion for the insect. The larvæ congregate round the mother and fill the gall.

The adult female fills the gall, and is as a rule of a dark greenish-grey colour, which becomes dark-brown and almost black with age. The general form is elliptical; the length averages about $\frac{1}{4}$in., but varies a good deal. The antennæ are obsolete, but appear to be represented by very minute tubercles, which, however, I have only been able to detect on insects before gestation; in the latest stages I cannot make them out. The feet are entirely absent. The rostrum, which is rather large, is situated almost in the middle of the ventral surface. I have not been able to satisfy myself as to the mentum, which seems to be monomerous. The four principal spiracles are large and conspicuous, the rest small. There are a great number of circular spinneret-orifices on the dorsal epidermis, and others, smaller and fewer, on the ventral. The anal ring is small and hairless, and the anal tubercles obsolete. At and after gestation the skin becomes much wrinkled, and the insect is then nothing but a bag containing a large number of eggs and larvæ.

Larva, reddish-brown, active, elliptical; length about $\frac{1}{23}$in. In the early part of this stage the form is proportionately narrow and elongated; the antennæ are moderately long and slender, with five distinct subequal joints, the third joint rather the shortest. The feet are slender, with the tibia shorter than the tarsus; claw slender; digitules all fine hairs; the mentum seems monomerous; the abdomen tapers

to a truncate extremity, where there are two very small anal tubercles, each bearing a very long seta. Later in the larval stage the form becomes shorter, thicker, and more conspicuously segmented; the antennæ are short and squat, and their joints more confused; the feet are a good deal thicker; the abdomen is short, and the setæ likewise.

The male appears to undergo all its transformations in the gall with the female. In the earliest stage it seems impossible to detect the difference between the male and female larvæ, but later on this becomes apparent. I possess a specimen which is evidently a male just entering upon the pupal stage. The elongated larval form is still noticeable; the antennæ and feet remain, and also the abdominal skin. But within, the new pupal formation is quite noticeable, with a slender, conical, segmented abdomen, and the beginnings of the future elytra appearing on the thoracic margins. The male pupa, after emerging from the larval skin, forms a small white cylindrical cottony sac; and I have found several of these in a gall with the adult female and larvæ, and with nearly adult males in them.

The adult male is deep-red in colour, the wings slightly iridescent. Length of the insect about $\frac{1}{20}$in. The form of the head and thorax offers nothing peculiar; but the abdomen is excessively elongated, the segments very long, narrow, and tapering. The last segment is about half as long as any of the others, and is wider and more elliptical; it terminates in the sheath of the penis, which, viewed dorsally, is cylindrical and straight, but viewed sideways is curved in a double hook; this sheath is very short. There are four short hairs on each side of the base of the sheath, but no long setæ. The antennæ have ten joints, all moderately long and subequal except the first, which is short and tubercular. Feet moderately long and slender.

I have no doubt as to the affinities of this insect, which, from the hairless anal ring, the absence of tubercles, feet, or antennæ, and from other characters, is clearly Idiococcid. In establishing last year the genus *Sphærococcus* I had no males to guide me, and could give no generic characters for that sex. I shall still hesitate to do so, for, although the male of *S. leptospermi* and also that of *S. froggatti* (described below) have excessively elongated abdominal segments, the male of *S. pirogallis* (below) does not exhibit so marked a feature. It may seem a simple thing to many people to establish generic characters on points which they have observed in some single species, or even some single specimen, which they have found. I wish very much that this habit (pernicious enough, in all conscience, amongst lepidopterists and coleopterists) could be sternly repressed in the study of Coccids. In the present

instance I will not define generically the male of *Sphærococcus* until we possess more information.

Sphærococcus melaleucæ, sp. nov. Plate VI., figs. 15–20.

Insects covered by small globular waxy tests, which are attached by one side to a twig. The tests are intensely black, and are rough, with numbers of small protruding conical processes, of which some are longer than others. Diameter of test averaging $\frac{1}{10}$in.

Adult female dull pinkish-red: form convex, elliptical, tapering slightly posteriorly; diameter about $\frac{1}{20}$in. The cephalic and thoracic segments are the widest and are smooth; the abdominal segments are narrow and are very closely marked with convoluted corrugations, which give a rough appearance to the abdomen. Antennæ very short, subcylindrical, with five subequal joints, the last being somewhat globular; on the last joint are several longish hairs. Feet absent. Mentum apparently dimerous; rostral setæ very long. The four thoracic spiracles are rather large, and close to each one there is a group of circular spinneret-orifices. Dorsal epidermis bearing some small circular spinnerets. Anal ring simple, hairless. Anal tubercles absent, and there are no terminal setæ or hairs.

Larva, second stage and male not observed.

Hab. In Australia, on *Melaleuca linariifolia*. Mr. Froggatt sent me specimens from Penshurst, New South Wales.

This appears to be quite distinct, in the roughness of the small conical processes on the test and in the curiously-corrugated segments of the abdomen.

Sphærococcus froggatti, sp. nov. Plate VII., figs. 1–7.

Insects inhabiting galls of a brownish- or reddish-yellow colour; these galls are apparently really somewhat cup-shaped, attached by their bases to a twig, but they are very short, and bear on their widest ends a number of long curling cylindrical slender processes (sometimes much longer than the gall), so that the general appearance is that of a reddish feathery mass, which might easily at first sight be taken for a flower. The galls which I have seen vary in size, some (including the processes) having only a diameter of $\frac{1}{5}$in., whilst others reach more than $\frac{1}{2}$in. The texture of the gall is woody, and in the cup-like portion wrinkled and corrugated, the processes being smoother. The processes seem to be more or less hollow, but I cannot detect any males or any stage of the females in them. The reddish colour fades away into yellow towards the end of a process.

The adult female occupies the cup-like portion of the gall. Its real colour is red, but it appears bluish-grey from being

powdered with white meal, and with much white meal also in the cavity of the gall. The form is subglobular, tapering somewhat posteriorly; the segments are obscure; the length varies, but may average about $\frac{1}{13}$in. The antennæ are almost atrophied, and appear to have only two very short joints, of which the second bears a few hairs. The mentum is dimerous. Feet entirely absent. There are four large spiracles. The epidermis bears a number of circular multilocular spinnerets interspersed with very fine spiny hairs, and on the last abdominal segments the spinnerets are more numerous and the hairs longer. Anal tubercles entirely absent; anal ring simple.

Female of the second stage not observed.

Larva yellow, flattish, elliptical, active; length about $\frac{1}{30}$in. Antennæ of six joints, the first much broader than the rest, all subequal in length, the last bears some hairs, of which one is rather long. Feet short; the femur is rather thick and swollen; tibia shorter than the tarsus; claw slender; digitules all fine knobbed hairs. Mentum conical, dimerous. The margin of the body bears a row of longish spines. The anal tubercles are reduced to mere dots, and the setæ are no longer than the marginal spines.

Male not observed by me. Mr. Froggatt has sent me a sketch of it, and says that it is red, with antennæ of nine joints, all with long hairs; wings opaline; abdomen very elongated, with the first three joints short, the rest long and tapering, and terminating in a pointed short spike. This male would thus resemble generally the male of *Sphær. leptospermi*.

Hab. In Australia, on *Melaleuca linariifolia*. Mr. Froggatt has sent me many specimens from Flemington, near Sydney, and I have much pleasure in dedicating to him this species, which, in the very peculiar and elegant form of the gall, seems to be entirely distinct.

Sphærococcus pirogallis, sp. nov. Plate VII., figs. 8–19.

Insects inhabiting small pear-shaped woody galls attached by very short stalks to a twig. The colour of these galls varies with age: in the earliest state they are usually bright-green, and are then frequently combined in a small mass. As they grow they become slightly tinged with red, then completely red, then a dark reddish-grey, and finally dull-grey speckled with small black spots: in this last state they are usually separate, but sometimes two are still joined together. Being frequently congregated in bunches containing very numerous individuals and covering the twigs, they may very easily (especially in their red condition) be taken for fruits or flower-buds, and they have very little resemblance at first sight to the work of an insect: in fact, they look then as

much like bunches of very small red-currants as anything else, and in their last grey state they are very like little seed-vessels. The average length of a fully-formed gall, inclusive of the little stalk, is about $\frac{1}{4}$in. The gall is hollow: the exterior surface minutely wrinkled, the interior smooth: the walls are thin, and in an old specimen they are seen to be double. At the thin end of the pear, at the point where it expands from the stalk, is a minute orifice. This appears to exist at all ages, but it is not easy to detect it in the earlier states, and possibly it may more generally not be open until late. At the larger end, inside, there is a small circular saucer-shaped projection in which the female insect lies: the diameter of this saucer (at full growth) is about $\frac{1}{30}$in. The saucer, the insect, and the interior surface of the gall are frequently powdered with thin white meal.

The male pupæ occupy the same gall as the females.

The larvæ (presumably) escape through the small orifice, and wander over the twigs to find a suitable resting-place. In the earliest, soft, green galls examined the small saucer was seen to be very rudimentary, the hollow interior of the gall being mainly occupied by the second stage of the female; and in some of the specimens arrived at the red state the already adult female was seen in the saucer with the exuviæ of the second stage still attached. In the hard grey fully-formed galls there were found sometimes only females full of eggs, sometimes also at the same time a small cylindrical mass of white cotton, coiled up in a circle, in which were embedded as many as thirty male pupæ, very symmetrically arranged with their tails turned towards the large end of the gall, and thus surrounding the already-impregnated female.

The adult female is red, darkening with age, subcircular, slightly concave beneath and not very convex above, lying in the saucer-like projection within the larger end of the gall, and attached to it by the rostrum, which is situate on a rather thick and prominent ventral boss. Diameter of the insect about $\frac{1}{35}$in. Antennæ very minute, the joints much confused and very short: there may be five or six joints, without any hairs. Feet entirely absent. Rostrum rather large and irregular; the mentum is rounded, and appears to be dimerous. Anal tubercles absent. Anal ring simple, hairless. Dorsal epidermis bearing many small circular multilocular spinnerets, which are most numerous near the margins. There are also many long spiny hairs, which are scanty on the median region, but numerous and conspicuous round the margin; and not far from the abdominal extremity there is a region where long hairs are arranged in a wide ring. There are four large thoracic spiracles.

The second stage of the female (which, as observed just

now, seems to commence the gall) is subglobular, of a rich-red colour, the abdominal region very slightly protruding and tapering; the longitudinal diameter of the insect is about $\frac{1}{90}$in. Antennæ very short and rather thick, with four joints, of which the first and fourth are longer than the other two; the fourth is globular, and bears a few hairs, of which one is rather slender. Feet rather long, the femur thick, and the tibia and tarsus slender; on the trochanter is a long hair; the tarsus is as long as the tibia; claw slender, digitules long fine hairs; there is one very long knobbed hair on the tarsus above the digitules. Abdomen terminating in two very minute tubercles with long setæ. There is a row of rather strong spines on the ventral margin of the body.

Larva not observed by me, but Mr. Froggatt tells me that it is pale-pink in colour, flattish and elliptical; antennæ very short and stout, with four joints; feet slender, claw long. He gives the length of the larva as about $\frac{1}{35}$in. This would make it nearly three times as long as the second stage—an abnormal condition amongst Coccids.

The male pupa is found, as stated above, in the gall of the female, embedded in white cotton, each pupa occupying a cell in the cotton; and all pointing in the same direction, the arrangement being very similar to that of cartridges in a bandolier; and the cotton is curled in a ring to fit the interior of the gall. The pupal skin is white, the red body of the insect showing through it. The form is elongated, slender, tapering posteriorly to a sharp point; the separation of the head and thorax can be detected. Length of the whole about $\frac{1}{16}$in.

Adult male bright-red, the antennæ and feet yellow; wings slightly iridescent; eyes four, two dorsal and two ventral, smooth and black; ocelli two. Antennæ of eight joints, the first two short and thick, the rest slender and moderately long, the length of each decreasing slightly from the third; all the joints bear several hairs. Feet slender, pubescent; the tibia is strongly spurred; claw small and slender; digitules fine hairs. The abdomen is not very long; the segments seem to be only two or three, slender and tapering, and terminate in a circular orifice through which protrudes the penis, an organ which is slender and very elastic. In a male just before emergence from the pupal cell it protrudes as a slender seta nearly as long as the body, but it is capable of being retracted almost entirely within the abdomen, and also of being extended until it reaches a length three times that of the whole body. When fully extended it is seen to consist of eight or nine joints, and to terminate in a slightly clavate divided tip bearing a few short hairs.

Hab. In Australia, on *Leptospermum flavescens*. Mr.

Froggatt has sent me a large number of specimens, and says that the insects "simply cover the bushes in several localities about Sydney."

This very distinct species presents a number of most interesting problems for the consideration of a student of Coccids. The little galls, so exactly like very small fruit or seed-vessels, would not be thought to be the habitation of insects by anybody but an entomologist. I have seen as many as two hundred of the little pears in one bunch on a twig scarcely more than 1in. long. The most curious points connected with the species are the growth of the gall, the position of the female, and the generative organ of the male. The larva appears merely to begin with the formation of a minute green pimple on the twig, and I presume that the duration of this stage is a very short one, for even the most rudimentary galls which I have been able to examine had within them females in the second stage. The characteristic pear-shape of the adult gall is not noticeable usually until it has reached the dark-red state, which is late in the second stage of the female; and the small orifice at the base, although probably present all through, is also scarcely noticeable up to the same period. The texture of the young gall is more clearly vegetable than in the old state, and the interior is more solid, with scarcely any hollow space. The complete woody, hollow, thin-walled, pear-shaped gall does not seem to be perfected until the female insect has reached the adult stage.

As regards the larvæ, I imagine that the sexes must separate very early: the female larvæ must escape through the orifice in order to seek new homes on the twig, while the male larvæ remain in the gall, and there undergo their metamorphoses. But here a difficulty arises, for in all the galls in which I have found the cottony "bandolier" with male pupæ there were also adult females containing eggs. It is clear that these could not be the mothers of the male pupæ, and possibly, therefore, the male larvæ, after emerging from their own maternal home, find their way into another, for the purpose of pupating in common.

I take it that the small orifice serves a double purpose. At the time when the female becomes adult it provides access for the very long male penis, which can thus reach the female at the far extremity without the necessity of the insect entering the gall, and later it serves as the door of exit for the larvæ, and for the adult males. These latter, having their heads in the pupal state turned towards the orifice, can emerge easily. If, however, they had to enter in order to reach the female they would find it difficult to turn in the gall, and so they insert merely the long penis with which they are furnished.

The most peculiar, and at present unaccountable to me, feature of the species is the position of the adult female in the gall. The food of a Coccid is usually the juices of the plant on which it lives, extracted *directly* from the plant by means of the rostral setæ. Properly, therefore, the female *Sphærococcus pirogallis* ought to be found attached within the gall to the twig itself, the gall being merely a covering for it, as in other species. Instead of that, we find it occupying a little saucer at the far end of the gall, and in such a position that the rostrum is attached to the saucer itself; consequently its nutriment must be drawn (if drawn at all) from the gall which it has first made, and then feeds on. There are Coccids (*e.g.*, *Porphyrophora*) which in the adult female stage seem never to feed at all; but then these possess no rostra or setæ. *Sphærococcus pirogallis* has a rostrum, a mentum, and the usual setæ: it, therefore, presumably uses these organs for feeding-purposes. But, if so, why is it placed in a saucer as far away as possible from the plant? It has been suggested to me that possibly there may be a flow of fluid between the two walls of which the gall is formed, and that this fluid, touching the base of the saucer, may be accessible to the setæ of the insect. But I can detect no sign of any fluid in the adult galls, the whole interior of which is powdered with dry meal, and the walls of which seem quite dry. As for the manner in which the gall acquires its pear-shape, how the stalk is formed, how the orifice is made and kept open, how, in fact, the gall-formation is controlled by its builder, which is placed in the most inconvenient position for the purpose, are questions which I am by no means able at present to answer.

There are four excellent papers on insect-galls by Mr. Butler in "Knowledge," July to October, 1893; but these do not deal with Coccids at all, nor do they elucidate the peculiarity just mentioned of *S. pirogallis*.

Subdivision MONOPHLEBINÆ.

Genus Icerya.

Icerya ægyptiaca, Douglas; *Crossotosoma ægyptiacum*. Douglas, Ent. Mo. Mag., March, 1890, p. 79. Plate VIII., figs. 1–3.

The second-stage female of this species is dark orange-red covered with white wax, and exhibits rudiments of waxy marginal processes like those of the adult. The form, when extracted from the wax, is elliptical and slightly convex. The antenna has nine joints, all subequal in length except the last, which is rather longer than the two preceding together; on all the joints are several longish hairs. The feet are strong,

the tarsus much curved; on the trochanter is a long hair; digitule of the claw only a short bristle. Abdomen terminating in a nearly smooth curve, from which spring six longish setæ; anal ring large and simple. The epidermis bears small circular multilocular spinnerets which are scanty on the median region but numerous near the margins, as in the adult; they are interspersed with short fine hairs with tubercular bases.

Hab. In Australia (Botany Bay), on *Goodenia ovata.*

Mr. Froggatt, in September, 1893, sent me a number of Coccids collected by him near Sydney. Amongst them were several specimens which were very clearly some species of *Icerya,* and on examining them I was much surprised to find that in all respects (except one) those of them which were adult were identical with Mr. Douglas's species originally reported from Egypt. The exception was the size: Mr. Douglas gives his as $\frac{1}{5}$in.; mine are all about $\frac{1}{10}$in.; but this discrepancy is of no importance in comparison with the other characters, which are identical. The dorsal white waxy matter, the irregular white fringe of projecting cottony processes, the form of the eleven antennal joints, the rostrum, the feet and digitules, the compound spinnerets, which are more numerous near the margins than on the median region, the terminal hairs and anal ring, the colour, and the larva agree entirely with specimens of *I. ægyptiaca* sent to me by Mr. Douglas. I have therefore no hesitation in considering these Australian insects as identical with those from Egypt. The difference of size is, as I said, unimportant; and, as none of my specimens has formed an ovisac, it is possible that they may not have reached their full development.

The question now arises, What is the native country of this *Icerya?* Neither Mr. Douglas nor Messrs. Riley and Howard (who treat of *I. ægyptiaca* in "Insect Life," November, 1890) suggests that it originated in Egypt. Mr. Newstead has had specimens from Madras, and it is interesting to note that these were accompanied by parasites. If the presence of parasites can be taken as an indication of endemic origin, this *Icerya* may perhaps be Indian. On receiving my specimens from Mr. Froggatt I was inclined to think, from the locality whence they came (Botany, near Sydney), that they might have been taken there on plants by passengers in steamers who might have stayed awhile at Cairo or Alexandria. But Mr. Froggatt afterwards told me that, although "the district was a settled one, with old orchards within a mile or so," the insects were found "quite in the bush, and pretty plentiful." No parasites accompanied the specimens, which were very lively, and, indeed, lived for a couple of weeks after they reached me. There is a rather large trade in horses from

Australia to India, and, on the other hand, a trade in tea from India to Australia; so that the transport of insects either way is probable enough, and either country may be the original home of *I. ægyptiaca*.

The second stage of this species has not hitherto been reported by Mr. Douglas or by Messrs. Riley and Howard.

Icerya rosæ, Riley and Howard, var. *australis*, var. nov. Plate VIII., figs. 4–8.

Adult female subglobular or very slightly elliptical, the ventral surface flat, the dorsum very convex: colour a deep rich brown, almost black, with a row of yellow spots on the margin and another row of similar spots midway: there would appear to be thus two spots on each segment on each side, but the segments are not very clearly defined; the general colour is often a lighter brown or even red in the early adult stage. The epidermis bears short scattered hairs, those at the abdominal extremity being rather the longest. There is some white cotton which forms a thin cushion beneath the insect and is also thinly scattered on the dorsal surface, but there is no posterior ovisac. Antennæ of ten joints (or sometimes eleven) subequal in length except the last, which is as long as any two others. Feet normal. Longitudinal diameter at full growth about $\frac{1}{5}$in. The twig on which the insect lives is covered with thin patches of white mealy cotton.

Second stage not observed.

Larva red, active, elliptical, flattish: feet and antennæ black. Antennæ normal, of six joints, as in *I. purchasi*. Feet normal. The abdominal extremity bears six very long setose hairs springing from small tubercular bases. The body is covered with many hairs, interspersed with longitudinal rows of multilocular spinnerets; these hairs are rather long all over, but the last three pairs on each margin of the abdomen are longer than the others, though not as long as the terminal ones, and are bent in an arch. Length of larva about $\frac{1}{33}$in.

Hab. In Australia, on *Hakea gibbosa*. Mr. Froggatt sent me a number of specimens from Sydney, and says, "Rare; only found on one plant."

This large and handsome species is so very near to *I. rosæ*, reported from Key West, Florida ("Insect Life," Sept., 1890), by Messrs. Riley and Howard, that I cannot consider it as more than a variety. The differences lie, first in the yellow dorsal spots of the adult female and in the ten-jointed antenna of that stage, and secondly in the arrangement of the hairs on the larva. As regards the adult antenna, I have carefully examined seven specimens, of which five had certainly ten joints, and the other two seemed to exhibit an eleventh. The type of *I. rosæ* is said (*loc. cit.*) to have the larva

"sparsely covered with short black hairs": those of var. *australis* are numerous and long: the type has on the abdominal margin six arched hairs, longer than the dorsal ones and shorter than the terminal ones, and according to the figure (Ins. Life, p. 94) these are distinctly separate: in var. *australis* there are three sets of arched hairs in pairs. I do not feel inclined at present to consider these differences sufficient to require a new species for this insect.

A question arises now whether perhaps Australia may not be the original home of all *Iceryæ*. There is scarcely any doubt about *I. purchasi; I. koebelei* is certainly Australian; *I. ægyptiaca* and *I. rosæ* are found there: *I. montserratensis* seems to be possibly a variety: *I. seychellarum* has as yet been reported on sugar-cane only from Mauritius: and *I. palmeri* on grape from Mexico: but even these may after all turn out to be Australian also. I may mention that Mr. T. Cockerell has sent me specimens of an *Icerya* from New Mexico, with a long and narrow ovisac which is not grooved: I shall not be surprised if this is the adult form of *I. palmeri*.

Monophlebus crawfordi, Maskell. Plate VIII., figs. 9–14.

In 1892 (N.Z. Trans., vol. xxv., p. 243) I gave details of the characters which, in my opinion, separated the varieties *levis* and *pilosior* from the type, as far as regarded the adult females. Since then I have examined carefully specimens of larvæ, with the result that I find the following differences:—

M. crawfordi, type. Larva reddish-brown: length $\frac{1}{28}$in. to $\frac{1}{24}$in. Dorsum covered with many longish, thick, subclavate hairs, and bearing some (not many) circular multilocular spinnerets. Feet only moderately spinous: spines slender. Antennæ of six joints, which might, perhaps, be considered as five, the separation of the third and fourth joints being frequently inconspicuous.

M. crawfordi, var. *levis*. Larva reddish-brown: length averaging $\frac{1}{26}$in. Dorsum bearing great numbers of large circular multilocular spinnerets and many short fine spiny hairs. Feet scarcely spinous: spines slender. Antennæ as in the type, with uncertain separation of the third and fourth joints.

M. crawfordi, var. *pilosior*. Larva reddish-brown: length averaging $\frac{1}{25}$in. Dorsum covered with many longish subclavate thick hairs, with several slender spiny hairs, and very few circular large multilocular spinnerets. Feet moderately spinous. Antennæ as in the type and in var. *levis*.

The feet appear to be longest in var. *pilosior* and shortest in the type, but the difference is not very marked.

Taking into consideration the foregoing characters, the differences noted last year in the adult females, and the general features and modes of propagation and growth in all these

forms, I am confirmed in my opinion that they are all only variations of one species. The larva of var. *levis* seems to be less near to the type than that of var. *pilosior*, but its adult form is nearer.

EXPLANATION OF PLATES III.–VIII.

PLATE III.

Fig. 1. *Aspidiotus casuarinæ*, female, showing groove.
Fig. 2. " pygidium of female.
Fig. 3. " male puparium.
Fig. 4. *Mytilaspis formosa*, insects on leaf.
Fig. 5. " group of puparia.
Fig. 6. " pygidium of female.
Fig. 7. *Mytilaspis spinifera*, insects on leaves.
Fig. 8. " diagram of female, to show spines and spinnerets.
Fig. 9. " pygidium of female.
Fig. 10. *Mytilaspis convexa*, insects on twig.
Fig. 11. " puparium, side view.
Fig. 12. " pygidium of female.
Fig. 13. *Mytilaspis grandilobis*, puparia.
Fig. 14. " pygidium of female.
Fig. 15. *Fiorinia rubra*, insects on bark.
Fig. 16. " puparia.
Fig. 17. " adult female.
Fig. 18. " pygidium of female.

PLATE IV.

Fig. 1. *Lecanium* (?), insect, dorsal view.
Fig. 2. " antenna.
Fig. 3. *Lecanium nigrum*, epidermal cells.
Fig. 4. *Lecanium depressum*, "
Fig. 5. *Lecanium begoniæ*, "
Fig. 6. *Pulvinaria maskelli*, var. *spinosior*, insects on twig.
Fig. 7. " " marginal spines.
Fig. 8. *Pulvinaria maskelli*, type, marginal spines.
Fig. 9. *Pulvinaria tecta*, insects on twig.
Fig. 10. " female and ovisac.
Fig. 11. " female, dorsal view.
Fig. 12. " antenna of female.
Fig. 13. " marginal spines and epidermal cells.
Fig. 14. " diagram of larval extremity.
Fig. 15. *Kermes acaciæ*, insects on twig.
Fig. 16. " female, ventral view.
Fig. 17. " epidermal pustules.
Fig. 18. " diagram of larval extremity.

PLATE V.

Fig. 1. *Planchonia bryoides*, insects on bark.
Fig. 2. " test of female, type.
Fig. 3. " " "
Fig. 4. " test of male.
Fig. 5. " adult female.
Fig. 6. " extremity of female.
Fig. 7. " spinnerets.
Fig. 8. " diagram of larva.
Fig. 9. " antenna of larva.

Fig. 10. Types of anal tubercles, *Solenophora corokiæ.*
Fig. 11. " *Gossyparia cavellii.*
Fig. 12. " *Rhizococcus totaræ.*
Fig. 13. " *Rhizococcus grandis.*
Fig. 14. " *Eriococcus leptospermi.*
Fig. 15. " *Eriococcus turgipes.*
Fig. 16. " *Sphærococcus froggatti.*
Fig. 17. " *Orthezia urticæ.*
Fig. 18. " *Dactylopius adonidum.*
Fig. 19. " *Dactylopius nipæ.*
Fig. 20. " *Dactylopius acaciæ.*
Fig. 21. " *Pseudococcus nivalis.*
Fig. 22. " *Ripersia fagi.*

Plate VI.

Fig. 1. *Dactylopius lobulatus*, adult female.
Fig. 2. " antenna.
Fig. 3. " anal tubercles.
Fig. 4. *Sphærococcus leptospermi*, galls on twig.
Fig. 5. " gall, closed, natural size.
Fig. 6. " gall, showing enclosed insect.
Fig. 7. " adult female.
Fig. 8. " larva (late).
Fig. 9. " antenna of ditto.
Fig. 10. " male pupa (early).
Fig. 11. " adult male.
Fig. 12. " abdomen of male.
Fig. 13. " last segment of male, dorsal view.
Fig. 14. " " side view.
Fig. 15. *Sphærococcus melaleucæ*, insects on twig.
Fig. 16. " tests enlarged.
Fig. 17. " adult female.
Fig. 18. " abdominal extremity of adult female.
Fig. 19. " antenna.
Fig. 20. " spiracle.

Plate VII.

Fig. 1. *Sphærococcusfroggatti*, galls on twig.
Fig. 2. " galls enlarged.
Fig. 3. " adult female.
Fig. 4. " antenna.
Fig. 5. " larva.
Fig. 6. " antenna of larva.
Fig. 7. " adult male.
Fig. 8. *Sphærococcus pirogallis*, galls on twig.
Fig. 9. " galls, young and old.
Fig. 10. " gall enlarged.
Fig. 11. " gall open, to show saucer and female, and male pupæ.
Fig. 12. " end of gall, showing saucer.
Fig. 13. " adult female.
Fig. 14. " female of second stage.
Fig. 15. " antenna of second stage.
Fig. 16. " foot of second stage.
Fig. 17. " male pupæ in band of cotton.
Fig. 18. " adult male.
Fig. 19. " abdomen and penis of male.


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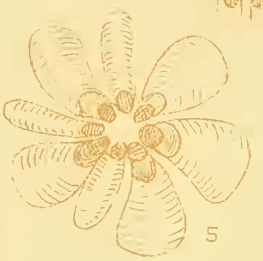
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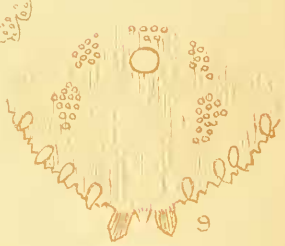
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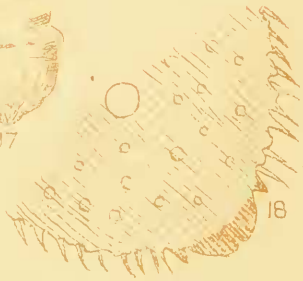
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Coccidæ

WM.M. del. ad nat.

F.H.T lith.